DOCUMENT RESUME

ED 445 861 RC 022 646

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TITLE Maintaining Respect for the Past and Flexibility for the Future: Additions and Renovations as an Integrated Sequence.
PUB DATE 2000-00-00
NOTE 25p.; Chapter 6 in: Improving Rural School Facilities: Design, Construction, Finance, and Public Support; see RC 022 640.
PUB TYPE Information Analyses (070) -- Reports - Descriptive (141)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Educational Facilities Design; *Educational Facilities Improvement; *Educational Facilities Planning; Elementary Secondary Education; Flexible Facilities; *Rural Schools; *School Buildings; School Community Relationship; School Expansion; *Sequential Approach

ABSTRACT

As an alternative to new construction or consolidation, many rural communities are considering the option of retaining their existing schools, upgrading them through renovations, and providing community-sensitive and effective additions as needed. The feeling of being connected to one's community can be enhanced by the continuity of community institutions, and in rural areas the school is an important community institution. The integrated sequence approach to an addition or renovation project is distinguished primarily by the commitment and effort applied to analyzing the existing building and integrating meaningful existing elements with new elements. Challenges to successful school renovation include state and federal building codes and standards, the need for flexible design, and environmental concerns. Steps in the integrated sequence approach involve organizing participants; formulating a plan that considers the life expectancy of existing buildings, elements with potential for reuse, the value of existing building components, and other cost variables; maintaining good communications with the community and the builders during the construction phase; commissioning the building; and final completion. Case histories describe the sequential renovation and development of school buildings in Cambridge, Minnesota, and McGregor, Minnesota. (Contains 26 references.) (SV)

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CHAPTER 6

ED 445 861

Maintaining Respect for the Past and Flexibility for the Future: Additions and Renovations as an Integrated Sequence

DAN SWEDBERG

Changes in population, funding, and political paradigms are forcing rural school districts to consider a broad range of options for upgrading rural school facilities. To respond to diverse demands, districts must choose from a broad menu of possible activities, including the renovation of existing school buildings, additions to existing school buildings, the construction of new facilities, and even consolidation with other districts. Consolidation of districts and total replacement of facilities will, at times, still be needed. Before moving to such a drastic change, however, the potential of addition and renovation projects needs to be fully examined. Additions or renovations to an existing school facility can often meet the evolving needs of a school or district while preserving the historical significance of the building and providing community members and students a link to their past.

Rural Schools and Their Communities

From the earliest history of organized education in rural America, schools have formed the heart of rural community life. Early rural schools were used for a variety of entertainment and social events,

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including theatrical performances, political meetings, and other community gatherings. They also provided social services, hosted worship services, and even housed out-of-town guests.[1] In the early 1900s, country schools served not only community children, they also served adults by providing evening education programs, sometimes referred to as moonlight schools. This close connection between school and community has been heavily documented in the literature throughout the past century.[2]

The connection between schools and communities is still so great that one could argue that they are often mutually dependent. The rise or fall of the social and economic conditions of a community will be greatly reflected in its schools. Similarly, removing a school from a community can have a significant deteriorating effect on the community's socioeconomic well being.[3]

In examining community, it is important to recognize the significance of the family and intergenerational connections. In a rural community, the values of family and community are often tightly interwoven. Thus, schools play an important role in a socialization process that is passed along from one generation to the next. But schools also provide opportunities for students to broaden their horizons beyond their own backyard. In a small rural community, this exploration can be tempered by a rich framework of family, friends, and acquaintances, all of whom monitor and provide feedback to a child regarding his or her actions.

There are many ways to describe the strengths of a rural, small town environment. Recently, Western Carolina University researchers Mary Jean Herzog and Robert B. Pittman conducted a survey of rural high school students in Cullowhee, North Carolina. The students were asked to describe what comes to mind when they think of "rural areas." The majority of responses were positive, with one student stating that he thinks of "common people, good people, love of land, beautiful scenery, men without shirts, kids without shoes, women without make-up, many people without a care in the world, small churches, not much traffic on dusty back roads." Responses emphasized the importance of relationships and relatedness, and references to nature were common. The most common words used in student responses were *peaceful, safe, warm.* The words *closeness, comfortable, friendly, home, quiet,* and *relaxing* were also used frequently.[4]

Paul Theobald and Paul Nachtigal suggest that rural environments are important in shaping a rural student's sense of self:

> Knowledge of place—where you are and where you come from—is intertwined with knowledge of self. Place holds the promise of contributing to the development of a meaningful identity . . . the more students understand their community and its environments—its social structure, its economy, its history, its music, its ecology—the more they become invested in that community.[5]

One way to define the purpose of education is to examine the Greek root of the word *school.* In their article on the political economy of rural school consolidation, Alan J. DeYoung and Craig B. Howley explain that the Greek word *schol* refers to contemplation, the suspension of activity, and leisure. DeYoung and Howley distinguish between schools as important places for people to create their culture, and *schooling* as an attempt at systematic instruction of predetermined bodies of knowledge. According to these writers, schools are places where meaning is created by the participants; in contrast, *schooling* is an approach to education that involves systematically providing predetermined knowledge.[6]

In the October 1996 issue of *Leadership News,* AASA executive director Paul Houston references a literature review conducted by Kathleen Cotton at Northwest Regional Educational Laboratory[7] that

> shows that small schools are superior to large ones on almost every measure . . . when small schools are not superior to large ones, they are just as good. This is true for both elementary and secondary schools, and is true for students of all ability groups and in every town and city in this country.[8]

Mr. Houston concedes that large schools offer more varied activities than small ones, but the average student in a large school does not take advantage of these opportunities. A benefit of rural schools is that they are naturally small and commonly include cross-age teaching, using the community as the curriculum. Rural schools also appear to support both experimentation and an interdisciplinary method of teaching.

Removal of Schools from Community

The symbiotic nature of communities and schools is an important part of our rural American culture. Yet, rural communities have faced a long-term threat of losing their local schools, as policies favoring school consolidation continue to be implemented across the nation. School and district consolidations have already closed many small schools and eliminated school boards serving rural populations. In 1913, there were 212,000 one-room schoolhouses in the United States, which educated half of the total national enrollment of school children. In 1994, only 428 of these schools remained in operation.[9] By the end of World War II, the number of school districts in the United States numbered a few more than 100,000.[10] By the late 1990's, there were approximately 14,400 districts across the nation.[11]

Two critical issues that have driven consolidation are the question of school size and the definition of educational goals. The call for larger, consolidated schools began in the early twentieth century with claims that larger schools allow for better educational opportunities due to a broader range of course options, better economies of scale, and lower operating costs per student.[12] However, school consolidation remained controversial throughout the twentieth century.[13]

Today, many states are struggling to define the minimum effective school size. Minnesota legislation on cooperative school grants and revenue sharing has limited participation to those schools averaging at least 60 persons per grade level, which would translate into a grade 9-12 high school minimum size of about 240 students. In the guidelines for those considering consolidation, a one-section elementary school, or approximately 175 students in a K-6 school, is considered a minimum size.[14]

National Education Goals

Goal 1: Ready to Learn

By the year 2000, all children will start school ready to learn.

Goal 2: School Completion

By the year 2000, the high school graduation rate will increase to at least 90 percent.

Goal 3: Student Achievement and Citizenship

By the year 2000, all students will leave grades 4, 8, and 12 having

demonstrated competency over challenging subject matter including English, mathematics, science, foreign languages, civics and government, the arts, history, and geography, and every school in America will ensure that all students learn to use their minds well, so they may be prepared for responsible citizenship, further learning, and productive employment in our nation's modern economy.

Goal 4: Teacher Education and Professional Development

By the year 2000, the nation's teaching force will have access to programs for the continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century.

Goal 5: Mathematics and Science

By the year 2000, United States students will be first in the world in mathematics and science.

Goal 6: Adult Literacy and Lifelong Learning

By the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

Goal 7: Safe, Disciplined, and Alcohol- and Drug-Free Schools

By the year 2000, every school in the United States will be free of drugs, violence, and the unauthorized presence of firearms and alcohol and will offer a disciplined environment conducive to learning.

Goal 8: Parental Participation

By the year 2000, every school will promote partnerships that will increase parental involvement and participation in promoting the social, emotional, and academic growth of children.[15]

At the national level, federal goals calling for dominance in global competition have been cited by some educators who promote larger schools (see box this page). Certainly Goals 5 and 6 speak to a desire to become highly competitive in the world economy through our educational achievements. Educators, under pressure to respond to these goals, have sometimes argued that larger schools, formed through consolidation, would help make students more globally competitive by increasing their opportunities to take specialized and

accelerated courses, including non-mainstream languages such as Russian or Japanese. Defenders of small schools, especially small rural schools, suggest that the many unique community-level cultures found in rural areas throughout the country should be preserved, and are more likely to be protected in smaller, locally controlled schools. These proponents argue that our national culture benefits from the diversity found in rural areas.[16]

Another force at work in the widespread closure and consolidation of rural schools has been the migration of rural people to urban areas and consequent falling rural enrollments. Currently this trend seems to be reversing, due at least in part to advances in communication technologies. Today, the nation's rural and small town areas are seeing some net in-migration.[17] This shift was described in a recent issue of *Time* magazine. Journalist Eric Pooley reported an increasing number of suburban people moving to small towns, primarily to obtain "quality of life" benefits often identified with small town living.[18]

This population shift is not without its problems, however. Often newcomers to rural communities have different expectations for their schools than do long-time residents. The *Time* article recounts a rancorous school board meeting in which old-timers complain about newcomers' efforts to "enlighten" the local folks. Although sometimes contentious, open dialogue can foster the retention of basic community values while improving the quality of a rural school experience. Whether initiated by newcomers or old-timers with a vision, this sort of dialogue is consistent with the integrated sequence approach to school facility improvement described later in this chapter. The ability to share core values, yet challenge others to consider improvement, is an indication of healthy communities and healthy schools.

The Big Question: Replace or Renovate?

In her 1961 book, *The Life and Death of Great American Cities*, Jane Jacobs describes the large-scale disasters created by urban renewal projects that eradicated entire urban neighborhoods and left gaping holes of nondevelopment due to years of inaction. Jacobs observed that even when fully rebuilt, many of these new neighborhoods lacked the flavor and cohesiveness found in the destroyed communities. As an alternative, she proposed constant renewal of neighbor-

hoods through intermingling buildings of all ages. This constant renewal provides a vitality that is brought about by new construction and the progress associated with it, while also preserving the historical and cultural flavor of the area.[19]

Jacobs' observations also have application for rural school construction and renovation projects. Several national and state policies favor consolidation or total replacement approaches over renovations and additions. However, as public opinion evolves beyond the "bigger is better" model and appreciation grows for the benefits of small rural settings, many school districts have become interested in preserving their existing school buildings.

A variety of obstacles can stand in the way of such projects, including changing building standards, lack of building documentation, concealed conditions, and hazardous materials. But for many schools, these obstacles are nonexistent or can be resolved. With careful organization and planning, the challenges of an addition/renovation project can be managed, leading to predictable and successful results.

One approach, the integrated sequence approach to renovations and additions, provides the vitality associated with new construction, while maintaining a sense of continuity with the past and preserving historically significant community symbols.

It does this by drawing upon features of an existing facility's history and design. Upon completion, the old and new elements work together synergistically as one composition, while also providing a space that satisfies current school needs and anticipates future needs. Often, these renovated buildings have the potential of bringing more meaning to a student's life than a brand new building and can be updated at a competitive cost compared to new facility construction.

The Integrated Sequence Approach

A rational way to consider design options is to examine the value comparisons of two alternatives: (1) constructing a new building or (2) providing additions and renovations to a building of similar size in an integrated sequence at 10-year intervals over a 40-year period. There are certainly cases when a full replacement is the best choice. However, the integrated sequence approach to additions and renovations provides a funding advantage because it allows the deferral of

some expenditures to future years. This is a financial benefit if the growth of a school's resources exceeds the rate of inflation of development costs. Renovating and adding onto buildings in 10-to 12-year stages also allows renovations to address today's and tomorrow's priorities. This stepped development allows communities to plan for flexibility and future expansion, leaving some options open for later decision making.

The integrated sequence approach begins by *mining the existing building*; that is, conducting an analysis to find code-related and technical building issues and, more importantly, discovering the essence of the existing building and its major contributions to the end product. This first step includes documenting existing conditions. Even when early design documents are available, they often present a sketchy rendering of the building compared with its current condition. Conducting a thorough assessment of the current condition of the building requires resources and, at times, special tests, to gather data about the suitability of various structural elements for future use. This step helps the architect to define design parameters to guide the final composition. Essential elements included in the final design preserve the building's historical significance, maintaining ties to generations of students in the past. An added benefit in renovation design is the opportunity it gives the architect to interview the school's students, who often willingly express their preferences and identify meaningful aspects of the school's design.

Often a historic facade forms the signature in defining a new entry space. One example of this can be found at the St. Joseph's Home for Children in Minneapolis, Minnesota. The facade for the new building has been "mined" out of the existing, historic facade. Another example is the strategically located exterior light well at Owatonna High School in Owatonna, Minnesota. This exterior light well was transformed into an interior atrium and student center, forming a heart to the building and connecting three levels to provide directional orientation in a dispersed floor plan. In Athena, Minnesota, a unique underplaza expansion in front of the historic old school answered the need for sizable new construction on a tight urban site.

The integrated sequence approach also supports reusing older school buildings for related community functions, even if the buildings can no longer serve as schools. Many school-related functions

such as district administration; community education; staff development; and early childhood, alternative, and at-risk programs can be creatively housed in existing structures. Other common alternative uses of abandoned school facilities include community cultural centers, recreational centers, or senior centers. Such uses can take advantage of schools' existing infrastructure, including gymnasiums, pools, auditoriums, kitchens, and shop spaces. Because the existing school building is frequently placed in a strategic location in the rural community, it is well suited to serve as a community center. However, even if a building must be demolished, distinctive elements of the structure often can be salvaged for reuse in new structures, providing some continuity with the past.

Building Codes and Standards

Both state and federal standards can provide challenges to the successful implementation of a school renovation or addition project. Older buildings may not meet new state building codes. The state of Minnesota provides one example. Its Department of Children, Families, and Learning provides a *Guide for Planning New and Improved School Construction Projects in Minnesota* that outlines some building requirements. Issues relating to consolidation, replacement, or reuse in upgrading a facility are covered in the guide.[20]

The following points illustrate just three building regulations that may pose problems for school addition or renovation projects:

- If the cost of bringing existing facilities up to code/standard approaches 60 percent of the cost of replacing the facilities, "a school district needs to replace the facility."[21]
- High school classroom utilization is suggested at full utilization minus one class period (for teacher preparation) or at 80 percent of full utilization.[22]
- Minimum recommended school site sizes are 10 acres for elementary schools, 25 acres for K-8 or middle schools, 35 acres for K-12 or small high schools, and 60 acres for large high schools (more than 2,000 students) with added size for larger enrollments.[23]

All of these standards could limit the options available in rural school renovation projects. Yet, there are many creative ways to

accommodate state standards and still carry out a successful project. An unwritten guideline in the Minnesota code allows planners—in cases where an otherwise appropriate addition/renovation project does not meet minimum site size—to include plans that resolve deficiencies of the site. This is important when an existing school site is ideally located in the community, but the site size is too small to meet the standards. Plans must be created to ensure that the site is adequate for the current and future life of the school, and provides flexibility to accommodate future growth. Adequate space is needed for coordination of vehicular drop-off and parking, and for a variety of other needs that may increase over time, such as athletic fields and additional parking. Newly emerging regulations such as Minnesota's requirement for on-site storm water detention must also be considered. On sites already stressed by limited size, planning storm water detention ponds that can be integrated into the site design can provide challenges.

Another recent regulatory issue complicating addition/renovation projects is the changing code requirements on structural live loads. Live loading (the weight of people, furnishings, rainwater, snow, etc.) of floors and roofs has in many instances increased above the loading required at the time many older buildings were constructed. In Minnesota in particular, the effect of drifted snow loading (snow banked into corners at vertical surfaces) has made it difficult to build even a new structure higher than existing adjacent roofs. Reinforcement of an existing structure may be required, and the costs and benefits of such a plan need to be analyzed carefully.

In one example, when the wood window frames were removed for window replacement in a 60-year-old three-story brick veneer building, it was found that the frames alone were supporting the wind loading on the brick. All of the original brick ties had rusted through and the brick veneer had no horizontal support. This required either new mechanical support or full replacement of veneer. This example points out the importance of thoroughly analyzing an existing building before deciding upon a renovation plan.

Federal legislation and standards can also affect the school renovation process. For example, the *Americans with Disabilities Act* has had a significant impact on the reuse of older facilities. Older buildings with larger spaces and fewer floor-level complications generally fare

better in reuse, but areas such as exterior steps, entry vestibules, room doors, hall widths, toilet areas, stairs, ramps, and elevators often require corrective action. Places of assembly such as gymnasiums and stadiums need to accommodate wheelchairs and provide access for disabled persons to view action at sporting events. Many older buildings still need to be upgraded to meet these requirements.

Flexible Design

Flexibility and adaptability of facilities need to be considered at all stages of design. Flexibility must be built in to allow for potential changes and expansions. William Peña outlined three basic elements of spacial flexibility: *expand ability*, i.e., space is easy to expand; *convertibility*, i.e., space is easy to reconfigure; and *versatility*, i.e., space is easy to use in multiple ways.[24]

One-room schoolhouses were amazingly versatile. Their space was very similar to the studio/lab room model, which is the most flexible space in modern school planning. Many things have changed since the original model. One example is the hot stove, which has been replaced by a variety of other items. But the concepts of movable seating, multiage grouping, and flexible classroom space are still used today. The original one-room schools even resemble current cutting-edge teaching spaces that integrate small group spaces, teacher offices, and small lab spaces adjacent to an open classroom space. Adjustable and adaptable with multiple concurrent activities, the schoolhouse concept continues to inspire generations of architects and school facilities planners.

Environmental Concerns

Disruption of long-dormant hazardous material and other environmental problems within a building is often unavoidable when renovations or additions are planned. Asbestos in building and pipe insulation, fire proofing, and floor and ceiling tiles is a common problem. Other problem areas include lead content of paint and leakage from below-ground oil storage tanks that can lead to soil contamination. Soil contamination can affect not only how a building can be placed on a site, but also site surface improvements. In addition/remodeling projects, site development expenses comprise the one area where costs can differ wildly from one location to another.

Air quality is another major topic in many school districts. Current standards for fresh air volume per student are now three times greater than volumes required in the early 1980s. Surprisingly, buildings built before 1970 often perform better on this score than buildings constructed more recently. Several factors account for better air quality in older facilities. Older materials are more inert and less likely than newer materials to have problems with off-gassing. Older facilities may also have been more loosely built, with air infiltration providing a degree of freshness not found in younger, tighter structures built to conserve energy. Buildings constructed between the early 1970s and early 1980s have posed the most difficulty with air quality due to a tighter building envelope and consequent reductions in fresh air. These changes were developed in response to the national energy crisis of that era.

Implementing an Addition or Renovation Project as an Integrated Sequence

The planning process. The integrated sequence approach to the educational facility planning process, focused on obtaining "the biggest bang for the buck," consists of a series of steps first developed by architect Bruce Jilk at HGA Associates.[25] The first steps, focused on plan formulation, include

- Organizing participants
- Gathering all relevant information and developing a needs analysis based on this information
- Collaborating with community stakeholders to develop all imaginable options to meet needs and to establish ranked and weighted criteria by which all options are judged
- Refining the most promising options and developing financial evaluations of each
- Developing consensus about which option to choose

Following these steps, which allow for both an evaluation of design issues and cost analysis, commonly provides a strong framework for deeper understanding of building renovation issues and their interrelatedness. This planning approach does not always lead immediately and directly to a final solution. Design criteria and other issues can always evolve as the study progresses. The process does, however,

set up a series of indepth examinations of needs, possible solutions, and analyses of benefits and costs to help uncover new approaches. When an option is finally chosen, a strong consensus can be expected as a result of using this process. With such a thorough approach, all committee members can explain how issues of value and cost were established.

This planning process begins by calculating the life expectancy of existing buildings. Life expectancy is defined as the time, in years, that a building can be used before improvements reaching the amount of its initial cost would be required to keep it in operation. The life expectancy of a freestanding new building may be estimated at 40 years. For building additions, life expectancy may be estimated at 30 years for an addition that is 50 percent the size of a 30-year-old building. This is calculated as follows: for a 30-year-old building, there are 10 good years remaining, plus 50 percent times 40 years (20 years), which equals a total of 30 years. To add 25 percent to the size of a 40-year-old building, the estimated life expectancy is 10 years. This is calculated as follows: there are 0 years remaining, plus 25 percent times 40, which equals a total of 10 years. Although this is a helpful formula, as in any addition/renovation project, significant judgment from past experience is required to review the age and evaluate the present condition of buildings slated for improvement.

Potential elements to consider for reuse. In general, elements of a building most likely to be available for reuse can be ranked (from most reusable to least reusable) as follows:

1. Site utilities
2. Structure
3. Site surface features
4. Demountable walls
5. Doors and windows
6. Mechanical systems (plumbing)
7. Roofing, insulation, and waterproofing
8. Interior partitions, doors, and frames
9. Electrical systems
10. Ceiling systems

11. Floor and wall finishes
12. Fixtures and equipment
13. Communications and electronic equipment
14. Furnishing items

Elements are more likely to be saved for reuse the higher they are ranked on this list, unless there is an unusual significance associated with a particular element.

In determining the value of different components of an existing two- to three-story junior high school building, the information shown in Table 6.1 was drawn from the 1997 Means National Cost Index: [26]

Table 6.1
Value of Building Components

System/component	Percent of subtotal
Foundations	3.0
Substructure	2.3
Superstructure	14.4
Exterior closure	14.5
Roofing	2.7
Interior construction	23.8
Conveying	0.8
Mechanical	24.0
Electrical	13.5
Special construction	1.0
Total	100.0

One example of a way to use this formula is to consider a building where 100 percent of its foundations, substructure, and superstructure were to be reutilized, but only 50 percent of its roof, exterior enclosure, mechanical systems, and electrical systems were to be reused. This building would yield a net reuse value of approximately 47 percent in terms of replacement cost. Subtracted from that amount, however, would be the demolition costs, hazardous material removal or abatement, and other preparation necessary to make a renovated building comparable to a new building at a similar level of partial completion.

For a more comprehensive view of cost options, several other factors would also need to be weighed:

- the benefits of working in a structure that is already enclosed
- the benefits of working in a space that may already provide workers with efficient heat and easy access to water, power, and accessible paved driveways for hauling materials
- the time of year the improvement will take place relative to seasonal labor force availability and premiums
- the cost impact of scheduling work in a facility that continues to be occupied, which may limit the hours of the day during which certain construction activities can be carried out, require the construction of temporary entrances and exits, and entail extensive planning for the phasing of construction and occupancies over the course of the work

Construction phase. The management and oversight of the construction phase of a facilities improvement project are critically important. A typical project management team consists of the owner's representatives, the architect, and one or more prime builders selected through a competitive bidding process. Rural school facilities projects frequently provide opportunities to involve local builders and contractors. Small rural communities often appreciate the opportunity to employ local people, even for a short term. While the bidding process should always be competitive, local participation can be encouraged by letting area builders know of the opportunity in advance. Additional techniques, such as using a letter of credit in place of performance bond requirements (where allowed), can further encourage small local builders who cannot easily obtain bonding (or do not wish to do so).

Using community volunteers on a building project can produce mixed results. Volunteer labor can be used for some phases, but it is important to have professional supervision. At its worst, volunteer labor can create more problems than it is worth because a school district may have to hire experts to correct mistakes made by volunteers. At its best, volunteer labor will reduce project costs and provide a sense of pride in the community.

In managing the construction phase of addition/renovation projects, it is important to get off to a good start. Lines of communication are

essential among the owner's representatives, architects, and builders. Our firm's approach to getting started includes drawing up a detailed list of expectations in the notice of award letter to the successful builder, with copies distributed to the owner's representatives. An even more extensive agenda for a preconstruction conference should immediately follow the notice of award letter. The preconstruction conference allows all parties to discuss procedural items in detail to ensure a shared understanding of their meaning, and to create strong lines of communication. At this stage, it is not uncommon to have team-building sessions or partnering workshops, a technique that was first initiated by the Corps of Engineers. The core issues to be communicated in this early phase are that individual benefits to participation in the project are directly tied to the overall project success and the project's success depends on the active cooperation of all team members.

Commissioning the building and occupancy. An important step to take before occupying a newly renovated school building is the *commissioning of a building*. During this step the major mechanical and electrical systems within the building are tested and the full building goes through a significant period of ventilation to carry away undesirable gasses from volatile compounds used in some new building materials. Although reductions in building material off-gassing have been achieved recently, some people are highly effected by even small amounts. Therefore, it is important to make sure the building has been fully ventilated before occupation.

Because many school districts want to continuously occupy a school facility during additions and renovations, it is common to have phased occupancies as different parts of the building are completed. This approach allows some space to be available for the activities of the school while other areas are vacated for construction. Working in an occupied building requires tolerance for frequent changes in the school environment and a focus on safety for students and staff. Although students tend to be resilient to change, they may also stray into areas of the building to which they should not have access. These circumstances put extra demands on everyone for continuous feedback to allow for adjustments in routines and safety precautions.

The final phase of an addition or renovation project is *occupancy*. As a district is moving toward full occupancy of a recently completed

building, the need for full communication among the owners, architects, and builders continues. The phase when occupancy begins is called *substantial completion* and occurs approximately one to two months prior to *final completion*. During the completion phase the architects prepare lists that clarify for the builder what steps are necessary for final completion. It is advisable to include a knowledgeable owner's representative in the development of the checklists and the subsequent inspections. This record of the building status prior to occupancy is important in case problems or defects arise after occupancy.

Case Histories

Cambridge, Minnesota. Cambridge is a rural town that has experienced constant change and growth as a result of in-migration by formerly urban and suburban residents over the past 40 years. In the 1960s, Cambridge schools consolidated with the adjacent community of Isanti to nearly double in size. The continual development of addition, renovation, and replacement projects on one school site in Cambridge makes for a study in the impacts of population growth and a history lesson in architectural form.

The Cambridge School District was established in 1869 with a one-room schoolhouse serving 31 students in a primarily Scandinavian immigrant community. The original structure was replaced with two rooms, followed by additions, amounting to a total of five rooms serving 160 students by 1899. By 1906, the student population had risen to 255, and the original wooden building was replaced with an eight-classroom brick building. This building was still in use in the mid-1970s when this author first became familiar with school needs. Subsequent building additions and renovations are listed below.

Cambridge School Site Improvement List

1906 Original eight-room brick building

1918 Addition of high school

1936 Major high school expansion including gymnasium/auditorium with full stage

1951 Addition of kitchen, cafeteria, with classrooms above

1954 Addition of shop spaces

1957 Addition of shop and classroom

1960 Separate new elementary school built adjacent with streamline connections, high school varsity gyms as part of elementary school

1961 Addition of a music room and locker room

1967 Two-story classroom addition to elementary school

1976 Conversion of building to junior high school with construction of new remote senior high

1986 Conversion of shop space to district community education offices and refinishing of auditorium space

1989 Addition of elementary media center

1994 Addition of classrooms, circulation areas, kitchen and dining space with multiple renovations

Although the original elementary and high school buildings were replaced by the additions in the mid-1970s, the original cupola and bell tower from the elementary school were retained as a historical marker and located near the subsequent school additions. This connection with the past was important because it is likely that many current students had parents, grandparents, and even great-grandparents involved in similar pursuits at this site.

Additions in the 1970s connected the gaps formed by the removal of the two original buildings, provided timely improvements, greatly simplified the flow of student traffic, and provided a point of orientation through the central media center. Additions in the 1990s increased student capacity, further improved student flow, and created a connecting link with the elementary school. This link consists of a shared kitchen and separate dining spaces.

Site improvements in the 1990s also greatly simplified student bus loading, staff and visitor parking, and access to campus. The need for separate zoning of three areas—bus drop-off/pick-up, auto drop-off/pick-up, and auto parking—presented sizable challenges. It was difficult to retrofit a site that was originally designed for simpler transportation needs. Add in the factors of delivery vehicle traffic, easy access to playgrounds, and the separation of all traffic routes, and this amounts to a significant challenge in addition/renovation design. Vehicle and pedestrian traffic also need to be managed for after-hour

community activities, including athletics, night classes, and a variety of club and social events. Fortunately, we were able to creatively resolve the space issues presented by this historic school site.

McGregor, Minnesota. The case history of the McGregor district differs markedly from that of Cambridge in that the school facility is located in a remote, very sparsely populated portion of the state. McGregor Schools is one of only 12 Minnesota districts with less than one student per square mile. McGregor also differs in that its evolution and growth are happening much more slowly. Our experience with the district consisted of one engagement for substantial improvements.

The first school in McGregor opened in 1903. In 1972, school consolidation brought together several small, mostly one-room schools from the nearby communities of Clark, Haugen, Rat Lake, Lawler, Tamarak, Grayling, East Lake, and Cornish to create the current McGregor School District.

The existing McGregor school building, originally constructed in 1921, consisted of three levels with a central gymnasium/auditorium space. Subsequent additions included six elementary classrooms on one level to the south, library space above the kindergarten classroom, a kitchen to the west, and major high school expansion to the north.

In 1990, the school district was working to identify options to meet their increasing space needs after having conducted about six unsuccessful capital referendum bond campaigns. They decided to begin the process with an open invitation for design contributions, which presented, which led to proposal submission and the eventual selection of the our team.

At the first organizational meeting, ideas about changing the tone of a future referendum proposal were the main concern. It was determined that the architect would meet individuals in the homes or workplaces of approximately a dozen influential community members. From these visits, insights on past frustrations and possible new solutions began to emerge. Next, a school planning committee was established, effectively interweaving school staff members, community leaders, and parents (and several people with multiple roles). This group met on several occasions and engaged in the planning process outlined earlier in this chapter. The result was a well-defined

integrated sequence approach to facility improvement that received community support and bond issue passage.

New program needs defined in our 1991 effort included additional elementary classrooms, a new elementary media center, a space that could be used as an elementary gym/cafeteria/community room and replacement kitchen, locker space integrated with a student center for upper grades, a new boiler and renovated back-up system, and various miscellaneous improvements. In order to attach a new building to the existing structure, significant work was needed to bring the building up to code. Code-related construction included the establishment of a new fire-rated separation within existing building elements and between the new and existing buildings.

Upon successful passage of the referendum, a new priority was established by the school district. In their opinion, it would be many years before the community would approve other major building improvements. Thus, they wanted to maximize the amount of space that could be built with referendum dollars so the structure would be flexible enough to meet future needs. Two new classroom spaces were added and they were divided to allow for four special small-group activity spaces. This new space allowed several classes to be relocated and opened up other classrooms for music classes and other special uses. Another project planned to diversify existing space was the addition of a stage to the new gym/community room.

Renovation of the McGregor School, located in the middle of a large timber-producing area of the state, had unique goals. McGregor's leaders insisted that their new boiler burn wood chips to support local industry. This request required us to specify new boiler equipment, but our engineers wisely created the flexibility of back-up burner capabilities for gas. After an energy audit a few years ago, a switch to propane gas did occur, allowing considerable cost savings and reduced maintenance. The ability to return to burning wood chips remains, however, if energy costs dramatically change.

A recent review of activities in McGregor indicates that the school is the hub of community life with ever-expanding use for school-related and nonschool-related activities. Besides sponsoring traditional scouting, athletic, and club events, the McGregor School opens its doors to a variety of county assemblies, political party caucuses, community

breakfasts and dinners, and community education functions. Frequently the facilities are used for funeral and bridal receptions, and even occasionally for marriage and funeral services.

Besides providing a home for community activities, the current McGregor school hosts a number of programs that draw in local business and student participation. One example, Kids Plus, an independently funded grant program that coordinates group activities aimed at students who are not engaged in other traditional school activities. At the time of this writing, plans are also underway to institute local participation in Minnesota's school-to-work program, which offers financial encouragement to modest-size local industries to provide employment and student internships.

The 1991 additions have instilled new pride in the community. With computer, cable, and satellite TV connections in every classroom, elementary students have access to a wide range of resources. A new plan for the school includes a media center and convenient break-out spaces located outside the doors of 50 percent of the classrooms.

Since the completion of the addition/renovation project in 1991, the number of Native American high school students has risen from approximately 7 to 10 percent of the total population. Improving programs for these students is a special challenge to the school, as past graduation rates demonstrate. Recently, about 25 percent of Native American students graduated compared to 95 percent of the Anglo population.

The demographics of the McGregor community continue to change. In 1997, 47 new homes were built in adjacent lake communities to the north. New arrivals are often retired persons, but several are of working age and primarily employed in the summer recreation industries. New families with school-age children have brought new ideas, particularly in promoting technology applications within the schools. Currently five McGregor students participate in optional college enrollment programs (at college sites) that are offered to qualified students in Minnesota. Ten other students are obtaining credit for college courses through interactive TV programming in concert with 15 other rural schools in northern Minnesota.

Conclusion

As an alternative to new construction or consolidation, many communities are considering the option of retaining their existing schools, upgrading them through renovations, and providing community-sensitive and effective additions as needed. The feeling of being connected to one's community can be enhanced by the continuity of the community institutions, and in rural areas the school is an important community institution. The integrated sequence approach to an addition or renovation project is distinguished primarily by the commitment and effort applied to the analysis of the existing building and to integrating meaningful existing elements with new elements. The goal of this approach is to renew the existing building while providing continuity with the old building and a direction for the future. This approach to school facility improvement has already met with success in several rural communities and represents an exciting alternative for those rural districts that are considering new facility construction or school consolidation.

Notes

1. Gulliford, *America's Country Schools*.
2. Theobald, *Teaching the Commons*.
3. Sell, Leistritz, and Thompson, *Socio-Economic Impacts of School Consolidation*.
4. Herzog and Pittman, "Home, Family, and Community."
5. Theobald and Nachtigal, "Culture, Community, and the Promise of Rural Education," 134.
6. DeYoung and Howley, "Political Economy of Rural School Consolidation."
7. Cotton, *School Size*.
8. Houston, "Thinking Small Makes a Big Difference," 2.
9. Gulliford, *America's Country Schools*.
10. Bureau of the Census, *Historical Statistics of the United States*.
11. National Center for Education Statistics, *Common Core of Data*.
12. Cubberly, *Rural Life and Education*.
13. Gulliford, *America's Country Schools*; Sargent, *Rural and Village Schools of Colorado*; Foght, "Rural Education"; Agee, *Let Us Now Praise Famous Men*; Fuller, *Old Country School*; and Coles, "Foreword."

14. Minnesota State Department of Children, Families, and Learning, *School District Organizational Alternatives*.
15. *Goals 2000: Educate America Act*, Sec. 102.
16. Theobald and Nachtigal, "Culture, Community, and the Promise of Rural Education."
17. Beale, "Nonmetro Population Rebound."
18. Pooley, "The Great Escape."
19. Jacobs, *Death and Life of Great American Cities*, 2.
20. Minnesota State Department of Children, Families, and Learning, *Guide for Planning*.
21. Ibid., 45.
22. Ibid., 41.
23. Ibid., 47.
24. Peña, *Problem Seeking*.
25. Hammel, Green and Abrahamson, Inc., an architectural design and engineering firm, has offices in Minneapolis and Rochester, MN; Milwaukee, WI; and Sacramento, CA.
26. R. S. Means CMD Group, *Means Square Foot Cost Data*, 187.

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